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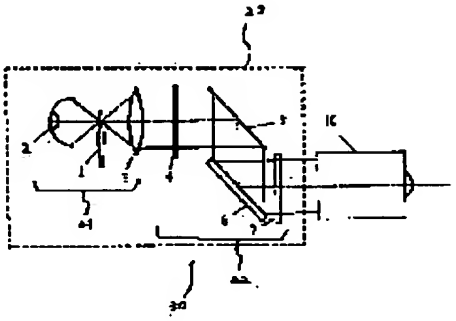
(54) IMAGE FORMING SYSTEM AND PROJECTION DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To eliminate a pseudo-contour or color slippage caused when a composite image is formed.
SOLUTION: An image forming system 20 is provided with a color light supply means 21 and an image forming means 22. Then, blue light, green light, red light and white light are time-sequentially supplied in this turn from the supply means 21. By the image forming means 22, a blue image, a green image, a red image and a white image constituting one color composite image are time-sequentially formed in this turn by compositing with the respective color light which are supplied. By forming the images in the reverse turn to the turn in which the images are composited in a cerebrum in such a way, the images of three colors forming one composite image can be extremely simultaneously composited in the cerebrum. Thus, since the pseudo-contour, the color slippage and the like can be eliminated, the clear image is obtained and unpleasant feeling and asthenopia can be reduced.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] A colored light supply means to supply blue glow, green light, red light, and the white light to this order in time amount sequential, Said blue glow supplied by said colored light supply means, said green light, said red light, The image formation system which has an image formation means to form the image corresponding to said white light based on the image information synchronized with said each colored light, and is characterized by coming to form an image in order of a blue image, green image, and red image and a white image in time amount sequential.
[Claim 2] In an image formation system according to claim 1 said colored light supply means It has the light source and a light filter for generating said colored light from the light by which outgoing radiation was carried out from said light source. Said light filter The blue filter for generating said blue glow, and the green filter for generating said green light, It has a filter for white for generating the red filter for generating said red light, and said white light. The image formation system characterized by coming to supply said blue glow, said green light, said red light, and said white light this order in time amount sequential when the light from said light source passes said blue filter, said green filter, said red filter, and said filter for white in this order.
[Claim 3] In an image formation system according to claim 1 said colored light supply means The light source for red which supplies said red light, and the light source for green which supplies said green light, The image formation system characterized by coming to supply blue glow, green light, red light, and the white light this order in time amount sequential by having the light source for blue which supplies said blue glow, and making this order turn on said light source for blue, said light source for green, said light source for red, and said all light sources.
[Claim 4] A colored light supply means to generate a predetermined protection-from-light period between the period which supplies blue glow, green light, red light, and the white light, and supplies said white light in time amount sequential, and the period which supplies said blue glow, Said blue glow supplied by said colored light supply means, said green light, said red light, The image formation system which has an image formation means to form the image corresponding to said white light based on the image information synchronized with said each colored light, and is characterized by coming to form an image in order of a blue image, green image, and red image and a white image in time amount sequential.
[Claim 5] In an image formation system according to claim 4 said colored light supply means It has the light source and a light filter for generating said colored light from the light by which outgoing radiation was carried out from said light source. Said light filter The blue filter for generating said blue glow, and the green filter for generating said green light, The red filter for generating said red light, and the filter for white for generating said white light, When it has a protection-from-light filter for generating said protection-from-light period and the light from said light source passes said blue filter, said green filter, said red filter, and said filter for white in this order The image formation system characterized by coming to generate said protection-from-light period in time amount sequential while said blue glow, said green light, said red light, and said white light are supplied to this order.
[Claim 6] In an image formation system according to claim 4 said colored light supply means The light source for red which supplies said red light, and the light source for green which supplies said green light, It has the light source for blue which supplies said blue glow. Said light source for blue, said light source for green, By establishing the period which makes said all light sources switch off between the period which makes this order turn on said light source for red, and said all light sources, and makes said light source for white turn on, and the period which makes said light source for blue turn on The image formation system characterized by coming to generate said protection-from-light period in time amount sequential while said blue glow, said green light, said red light, and said white light are supplied to this order.
[Claim 7] The projection mold display characterized by having an image formation system according to claim 1 to 6 and a projection means to project the light by which outgoing radiation was carried out from said image

formation system.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the image formation system which forms one color composite image by forming the red image, the blue image, green image, and white image used as a basic image in time amount sequential. Moreover, this invention relates to the projection mold display which adopted such an image formation system.
[0002]
[Description of the Prior Art] In recent years, the projection mold display using a liquid crystal panel is known, and the many use three liquid crystal panels. After a dichroic mirror's separating into red light, green light, and blue glow the light by which outgoing radiation was carried out from the light source and modulating each of such colored light with three liquid crystal panels, he is trying to form an image by compounding with a dichroic mirror or synthetic prism in such a projection mold display. Moreover, that to which portability becomes important like a head wearing mold display forms one color composite image by arranging a red filter, a green filter, and a blue filter with sufficient balance corresponding to each pixel of a liquid crystal panel, and modulating the light which penetrates these filters by each pixel.
[0003] Furthermore, while using the image formation panel of a reflective mold called a digital micro mirror device (DMD) instead of the liquid crystal panel mentioned above, the projection mold display adapting the Digital Light Processing (DLP) technique which Texas Instruments, Inc. has proposed is also proposed. This projection mold indicating equipment transposes the liquid crystal panel mentioned above to a digital micro mirror device, and the method of forming a color composite image is the same as the projection mold indicating equipment and basic target using the liquid crystal panel described previously. Moreover, the projection mold display using one digital micro mirror device is also proposed. Such a projection mold display is equipped with the rotor plate type light filter with which the red filter, the green filter, and the blue filter were formed, forms the colored light of three colors with these filters, and forms a red image, a green image, and a blue image by making it synchronize with the timing to which each colored light is supplied by the digital micro mirror device, and performing an image processing.
[0004]
[Problem(s) to be Solved by the Invention] A projection mold indicating equipment is a tool very convenient to indicate data and the image by the big screen in presentations, such as a board and a lecture meeting. However, in the projection mold display mentioned above, in order to use three liquid crystal panels, and since optical system and a circuit system are complicated in connection with using three liquid crystal panels, it is very expensive. Moreover, although the image is formed with one liquid crystal panel equipped with the light filter in the head wearing mold display, in order to have to form in the combination of three pixels equipped with the light filter which supplies colored light which is mutually different in one picture element, resolution will fall.
[0005] Furthermore, the projection mold display which used three digital micro mirror devices (DMD) is several times as expensive as the projection mold display which used three liquid crystal panels instead of the liquid crystal panel. Moreover, since low-pricing can realize the projection mold indicating equipment using one digital micro mirror device to some extent, the application to television is also fully considered. However, in the actual condition, since the configuration of a rotor plate type light filter is inadequate, problems in formation of a dynamic image, such as false coutour and color gap, are not solved.
[0006] This invention aims at solving the problem which such a conventional technique has.
[0007]
[Means for Solving the Problem] The artificer of this invention inquired about the physiology brain [an eye and a

brain] problem, extracted the requirements with which a projection mold display should be equipped, and resulted in completion of this invention.
[0008] A colored light supply means by which the image formation system of this invention 1st supplies blue glow, green light, red light, and the white light to this order in time amount sequential, Said blue glow supplied by said colored light supply means, said green light, said red light, It has an image formation means to form the image corresponding to said white light based on the image information synchronized with said each colored light, and is characterized by coming to form an image in order of a blue image, green image, and red image and a white image in time amount sequential.
[0009] People's retina structure is shown in drawing 9. On people's retina, the visual cell of two kinds of being called the cone cell which recognizes a color and a form, and the rod cell which reacts to brightness sensitively exists. It results in a ganglion cell through some paths, and it becomes an optic nerve fiber eventually, and converges on the optic-disk section, and these cells are left out of an eyeball as an optic nerve. An optic nerve fiber is divided into three fiber groups from which a size is different in this process. The thickest nerve-fiber group has the quickest speed of response to a luminous stimulus, the thinnest nerve-fiber group has the slowest speed of response to a luminous stimulus, and the nerve-fiber group of a medium serves as a middle speed of response of the thickest fiber group and the thinnest fiber group to the luminous stimulus. Moreover, as for blue and the nerve-fiber group of a medium, the nerve-fiber group with these thickest nerve-fiber groups tells the information that red and the thinnest nerve-fiber group are green (303 H. - T.Change:J.Neurophysiol., 19,224- 231, 1953, KMotokawa :J.Neurophysiol., 12,289- 1949). From the above thing, he can understand that the information on a color is red and the green and blue mechanism told to the visual center of a cerebrum in time amount sequential.
[0010] He is trying to be compounded by the cerebrum by the image formation system of this invention in view of the physiological mechanism that image composition processing is carried out in time amount sequential in order of a red image, a green image, and a blue image on an observer's own high order cerebrum level, as simultaneously [the image of three colors which form one synthetic image by performing image formation in order of reverse] with the sequence by which image composition processing is carried out by the cerebrum as possible. Therefore, false coutour, color gap, etc. are mitigable, and while a clear image is obtained, it becomes possible to mitigate displeasure and asthenopia.
[0011] When it considers as the configuration equipped with the light filter for generating colored light in the above-mentioned image formation system from the light by which outgoing radiation was carried out from the light source and the light source concerned in the colored light supply means The blue filter for generating blue glow for a light filter, and the green filter for generating green light, It considers as the configuration equipped with the red filter for generating red light, and the filter for white for generating the white light. If it is made to pass the light by which outgoing radiation was carried out from the light source in order of a blue filter, green filter, and red filter and the filter for white, it will become possible in time amount sequential to supply blue glow, green light, red light, and the white light to this order. In addition, the thing and transparence filter of the configuration which makes the light by which outgoing radiation was carried out from the light source penetrate as it is, i.e., a configuration of that only this part does not prepare a filter, are also contained in the filter White for white.
[0012] Moreover, in the above-mentioned image formation system, it is good also as a configuration equipped with the light source for red which supplies red light for a colored light supply means, the light source for green which supplies green light, the light source for blue which supplies blue glow, and **. In this case, blue glow, green light, red light, and the white light are supplied to this order in time amount sequential the light source for blue, the light source for green, the light source for red, and by making this order turn on the light source altogether.
[0013] A colored light supply means to generate a predetermined protection-from-light period between the period which the image formation system of this invention 2nd supplies blue glow, green light, red light, and the white light in time amount sequential, and supplies said white light, and the period which supplies said blue glow, Said blue glow supplied by said colored light supply means, said green light, said red light, It has an image formation means to form the image corresponding to said white light based on the image information synchronized with said each colored light, and is characterized by coming to form an image in order of a blue image, green image, and red image and a white image in time amount sequential.
[0014] Also by the image formation system of this invention 2nd, the same effectiveness as the 1st image formation system mentioned above can be acquired. Moreover, according to the 2nd image formation system, by establishing a protection-from-light period, the after-image of a blue image [which was formed before the protection-from-light period], green image, and red image and a white image can be eliminated, and it becomes possible to obtain a still clearer image.
[0015] When it considers as the configuration equipped with the light filter for generating colored light in the

image formation system of the above 2nd from the light by which outgoing radiation was carried out from the light source and the light source concerned in the colored light supply means The blue filter for generating blue glow for a light filter, and the green filter for generating green light, The red filter for generating red light, and the filter for white for generating the white light, If it is made to make it pass in order of a blue filter, green filter, and red filter, the filter for white, and a protection-from-light filter, the light by which considered as the configuration equipped with the protection-from-light filter for generating a protection-from-light period, and outgoing radiation was carried out from the light source In time amount sequential, while supplying blue glow, green light, red light, and the white light to this order, a protection-from-light period is generable. In addition, the thing and transparence filter of the configuration which makes the light by which outgoing radiation was carried out from the light source penetrate as it is, i.e., a configuration of that only this part does not prepare a filter, are also contained in the filter White for white.

[0016] Moreover, the light source for red which supplies red light for said colored light supply means in the image formation system of the above 2nd, When it considers as the configuration equipped with the light source for green which supplies green light, the light source for blue which supplies blue glow, and ** By establishing the period which makes all the light sources switch off between the period which makes this order turn on the light source for blue, the light source for green, the light source for red, and all the light sources, and makes all the light sources turn on, and the period which makes the light source for blue turn on In time amount sequential, while supplying blue glow, green light, red light, and the white light to this order, a protection-from-light period is generable.

[0017] The projection mold display of this invention is characterized by having a projection means to project the light by which outgoing radiation was carried out from an above-mentioned image formation system and this above-mentioned image formation system. Since the projection mold display of this invention is equipped with the above-mentioned image formation system, it can possess itself of the effectiveness by each above-mentioned image formation system. Furthermore, it is possible to constitute an image formation means from one liquid crystal panel, a digital mirror device, etc., and since optical system and a circuit system are simplified, a miniaturization and portable improvement are attained. Moreover, the cutback of a manufacturing cost also becomes possible.

[0018]

[Embodiment of the Invention] With reference to a drawing, the gestalt of suitable operation of this invention is explained below.

[0019] (1st operation gestalt) Drawing 1 is the image formation system of this invention, and the schematic diagram showing the 1st operation gestalt of a projection mold display in a list.

[0020] The projection mold display 30 is equipped with the image formation system 20 and the projection lens 10 as a projection means to project the light by which outgoing radiation was carried out from the image formation system 20.

[0021] The image formation system 20 has a colored light supply means 21 to supply red light, blue glow, green light, and the white light, and an image formation means 22 to form the image corresponding to the colored light supplied from the colored light supply means 21 based on image information.

[0022] The colored light supply means 21 is equipped with the light filter 1 for generating red light, blue glow, green light, and the white light in time amount sequential from the light by which outgoing radiation was carried out from the light source 2 and the light source 2, and the lens 3 which outgoing radiation is carried out from the light source 2, and makes light which passed the light filter 1 abbreviation parallel light. The image formation means 22 is equipped with the polarizing plate 4, the reflective mirror 5, the liquid crystal panel 6, and the polarizing plate 7. The colored light generated in time amount sequential from the color supply means 21 passes a polarizing plate 4, it is reflected by the reflective mirror 5 and only a predetermined polarization light carries out incidence of it to a liquid crystal panel 6. A liquid crystal panel 6 is a liquid crystal panel of the reflective mold to which the light which carried out incidence is modulated and outgoing radiation of the modulated light is carried out as the reflected light. The light reflected by the liquid crystal panel 6 passes the polarizing plate 7 arranged in the optical path of the reflected light, and amplification projection only of the predetermined polarization light is carried out with the projection lens 10.

[0023] Here, a light filter 1 is a rotor plate type light filter equipped with the filter White for white for generating the red filter R and the white light for generating the green filter G and red light for generating the blue filter B and green light for generating blue glow, as shown in drawing 2 (a). And these filters are arranged so that the light from the light source may pass the blue filter B, the green filter G, the red filter R, and the filter White for white in this order. Therefore, from a colored light supply means, blue glow, green light, red light, and the white light will be supplied to this order in time amount sequential. On the other hand, in time amount sequential, to a liquid crystal panel 6, the image information of blue glow, the image information of green light, the image information of red

light, and the image information of the white light are supplied, and a liquid crystal panel modulates light from the image information supply means which is not illustrated to it based on such image information. Such image information makes it synchronize with supply of blue glow, green light, blue glow, and the white light, and is supplied. Therefore, a blue image [which constitutes one color composite image from one revolution (in view of a light source side counterclockwise rotation) of a light filter 1], green image, and red image, and a white image can be formed in this order in time amount sequential.

[0024] He is trying to be compounded as simultaneously [the image of three colors which form one synthetic image by performing image formation in order of reverse] with the sequence by which image composition processing is carried out in this way by the cerebrum in view of the physiological mechanism that image composition processing is carried out in time amount sequential in order of a red image, a green image, and a blue image on an observer's own high order cerebrum level as possible by the image formation system 20 list of this example by the cerebrum with the projection mold indicating equipment 30. Therefore, false coutour, color gap, etc. are mitigable, and while a clear image is obtained, it becomes possible to mitigate displeasure and asthenopia.

[0025] In addition, the filters White for white may be the configuration which makes the light by which outgoing radiation was carried out from the light source 2 penetrate as it is, i.e., the configuration which does not prepare a filter only in this part, and a transparence filter. Therefore, suppose that the thing and transparence filter of a configuration of not preparing a filter in this way are also included in "the filter White for white" in explanation of this operation gestalt, and explanation of the following modifications or an operation gestalt.

[0026] (Modification 1 of a light filter 1) Instead of the light filter 1 mentioned above, the light filter 11 as shown in drawing 2 (b) may be used. A light filter 11 is a rotor plate type light filter equipped with the filter White for white for generating the red filter R and the white light for generating the green filter G and red light for generating the blue filter B and green light for generating blue glow, and the protection-from-light filter Black. And these filters are arranged so that the light from the light source may pass the blue filter B, the green filter G, the red filter R, the filter White for white, and the protection-from-light filter Black in this order. Therefore, from a colored light supply means, in time amount sequential, while blue glow, green light, red light, and the white light are supplied to this order, a predetermined protection-from-light period will be generated between the period which supplies the white light, and the period which supplies blue glow. What is necessary is on the other hand, just to supply the image information of blue glow, the image information of green light, the image information of red light, and the image information of the white light to a liquid crystal panel 6 in time amount sequential like the case of the operation gestalt described previously. The image information supplied at a protection-from-light period is arbitrary.

[0027] The effectiveness same in the image formation system 20 list concerning the operation gestalt which also mentioned the projection mold display above in the image formation system list using a light filter 1 like this example as the projection mold display 30 can be acquired. Furthermore, with a projection mold display, by preparing a white image, the improvement in brightness and contrast sensitivity can be raised in the image formation system list using the light filter 1 of this example, and the effectiveness of becoming possible to obtain a still clearer image is in it. Furthermore, by establishing a protection-from-light period, the after-image of a blue image [which was formed before the protection-from-light period], green image, and red image and a white image can be eliminated, and it is effective in becoming possible to obtain a clear image similarly.

[0028] (Modification 2 of a light filter 1) Although the light filter 1 and light filter 11 which were mentioned above are a light filter which supplies colored light for each to form one synthetic image by one revolution, it is also possible to transpose to the light filter which supplies the colored light for forming two or more synthetic images by one revolution for this.

[0029] Drawing 3 is drawing showing the example of the rotor plate type light filter which supplies the colored light for forming two synthetic images by one revolution.

[0030] The light filter 12 shown in drawing 3 (a) is equipped with the blue filter B, the green filter G, the red filter R, and every two filters White each for white. Moreover, these filters are arranged so that the light from the light source may pass the blue filter B, the green filter G, the red filter R, and the filter White for white in this order. Therefore, from a colored light supply means, blue glow, green light, red light, and the white light will be supplied to this order in time amount sequential. Like the case of the operation gestalt previously stated to the liquid crystal panel 6, in time amount sequential, if the image information of blue glow, the image information of green light, the image information of red light, and the image information of the white light are supplied, a blue image [which constitutes two color composite images from one revolution (in view of a light source side counterclockwise rotation) of a light filter 12], green image, and red image, and a white image can be formed in this order in time amount sequential.

[0031] Furthermore, the light filter 13 shown in drawing 3 (b) is equipped with the blue filter B, the green filter G, the red filter R, the filter White for white, and every two protection-from-light filters Black each. And these filters are arranged so that the light from the light source may pass the blue filter B, the green filter G, the red filter R, the filter White for white, and the protection-from-light filter Black in this order. Therefore, from a colored light supply means, in time amount sequential, while blue glow, green light, red light, and the white light are supplied to this order, a predetermined protection-from-light period will be generated between the period which supplies the white light, and the period which supplies blue glow. Like the case of the operation gestalt previously stated to the liquid crystal panel 6, in time amount sequential, if the image information of blue glow, the image information of green light, the image information of red light, and the image information of the white light are supplied, a blue image [which constitutes two color composite images from one revolution (in view of a light source side counterclockwise rotation) of a light filter 12], green image, and red image, and a white image can be formed in this order in time amount sequential. The image information supplied at a protection-from-light period is arbitrary.
[0032] Thus, the number of the groups (group of blue glow, green light, red light, and the white light) of the colored light which can be supplied to per revolution of a rotor plate type light filter can be set as arbitration by changing the number of combination of the filter of each color containing a protection-from-light filter.
[0033] (2nd operation gestalt) Drawing 4 is the image formation system of this invention, and the schematic diagram showing the 2nd operation gestalt of a projection mold display in a list. This operation gestalt differs from the 1st operation gestalt mentioned above in that the reflective mirror 5 (refer to drawing 1) for carrying out incidence of the light to the point and liquid crystal panel which are a liquid crystal panel of the transparency mold which makes the transmitted light light by which the liquid crystal panel was modulated, and carries out outgoing radiation is not used. About other points, since it is the same as that of the 1st operation gestalt mentioned above, the detailed explanation is omitted. In addition, about the same component as the 1st operation gestalt mentioned above, the same sign as what was used by drawing 1 is used.
[0034] The projection mold display 50 is equipped with the image formation system 40 and the projection lens 10 as a projection means to project the light by which outgoing radiation was carried out from the image formation system 20.
[0035] The image formation system 40 has a colored light supply means 21 to supply red light, blue glow, green light, and the white light, and an image formation means 23 to form the image corresponding to the colored light supplied from the colored light supply means 21 based on image information.
[0036] The colored light supply means 21 is the completely same configuration as the colored light supply means 21 concerning the 1st operation gestalt, and is equipped with the light filter 1 for generating red light, blue glow, green light, and the white light in time amount sequential from the light by which outgoing radiation was carried out from the light source 2 and the light source 2, and the lens 3 which outgoing radiation is carried out from the light source 2, and makes light which passed the light filter 1 abbreviation parallel light. The image formation means 23 is equipped with the polarizing plate 4, the liquid crystal panel 8, and the polarizing plate 7. The colored light generated in time amount sequential from the color supply means 21 passes a polarizing plate 4, and only a predetermined polarization light carries out incidence to a liquid crystal panel 8. A liquid crystal panel 8 is a liquid crystal panel of the transparency mold to which the light which carried out incidence is modulated and outgoing radiation of the modulated light is carried out as the transmitted light. The light reflected by the liquid crystal panel 8 passes the polarizing plate 7 arranged in the optical path of the reflected light, and amplification projection only of the predetermined polarization light is carried out with the projection lens 10.
[0037] Also with the projection mold display 50, the same effectiveness as the 1st operation gestalt mentioned above can be acquired in the image formation system 40 list of this operation gestalt. In addition, of course, it is also possible to adopt the light filters 11, 12, and 13 as shown in drawing 2 (b), drawing 3 (a), and drawing 3 R> 3 (b) instead of the light filter 1 of this operation gestalt.
[0038] (Modification of the colored light supply means 21) the colored light supply means 21 in the 1st operation gestalt and the 2nd operation gestalt which were mentioned above -- the light source and a rotor plate-type light filter -- time order -- although it was degree thing which supplies the colored light of three colors of blue glow, green light, and red light, and the colorless white light-like, this can also be transposed to the colored light supply means 24 as shown in drawing 5 .
[0039] The colored light supply means 24 shown in drawing 5 is equipped with red light emitting diode 25R as the light source for red for supplying green light emitting diode 25G and red light as blue light emitting diode 25B as the light source for blue for supplying blue glow, and the light source for green for supplying green light. The electrical signals 27B, 27G, and 27R as shown through Terminals 26B, 26G, and 26R at drawing 6 (a), respectively are supplied to the light emitting diodes 25B, 25G, and 25R of each color. As for blue light emitting diode 25B,

only the standup period of electrical signal 27B is turned on, as for green light emitting diode 25G, only the standup period of electrical signal 27G is turned on, and, as for red light emitting diode 25R, only the standup period of electrical signal 27R is turned on. Therefore, each light emitting diode will be turned on in time amount sequential by order called blue light emitting diode 25B, green light emitting diode 25G, and red light emitting diode 25R and all the light emitting diodes 25B, 25G, and 25R, and blue glow, green light, red light, and the white light will be supplied to an image formation means at this order. If such a colored light supply means 24 is used, the effectiveness same in the image formation system list which adopted the light filters 1 and 12 shown in drawing 2 (a) and drawing 3 (a) as a projection mold display can be acquired.

[0040] Furthermore, what is necessary is just to supply the electrical signals 28B, 28G, and 28R as shown in Terminals 26B, 26G, and 26R at drawing 6 (b) like the light filters 11 and 13 shown in drawing 2 (b) and drawing 3 (b), in order to supply a protection-from-light period. In the electrical signal shown in drawing 6 (b), the period t2 which makes all light emitting diodes switch off between the period t1 which makes all the light emitting diodes 27B, 27G, and 27R turn on simultaneously, and the period t3 which makes blue light emitting diode 27B turn on is established. Therefore, in time amount sequential, while blue glow, green light, red light, and the white light are supplied to this order, a protection-from-light period is generated between the period when the white light is supplied, and the period when blue glow is supplied. If such a colored light supply means 24 is used, the effectiveness same in the image formation system list which adopted the light filters 11 and 13 shown in drawing 2 (b) and drawing 3 (b) as a projection mold display can be acquired.

[0041] In addition, fluorescence tubing, a neon tube, a high-pressure mercury-vapor lamp, a plasma fluorescent substance, electroluminescence, the laser light source, etc. may be used instead of light emitting diode.

[0042] (Other operation gestalten) The configuration of the projection mold display concerning an above-mentioned operation gestalt is applicable to all of the projection mold display of a rear mold that perform projection from an opposite side with the side which observes the projection mold display and projection side of the front mold which performs projection from the side which observes a projection side.

[0043] Moreover, a digital micro mirror device (DMD) is also employable instead of the liquid crystal panel 6 (refer to drawing 1) of the reflective mold concerning the 1st operation gestalt. In addition, when a digital macro mirror device is adopted, polarizing plates 4 and 7 become unnecessary.

[0044]

[Effect of the Invention] As more than explained, in the image formation system list of this invention in a projection mold display By performing image formation in order of reverse with the sequence by which image composition processing is carried out by the cerebrum in view of the physiological mechanism that image composition processing is carried out in time amount sequential in order of a red image, a green image, and a blue image on an observer's own high order cerebrum level The image of three colors which form one synthetic image is made to be compounded by the cerebrum as simultaneous as possible. Therefore, false coutour, color gap, etc. are mitigable, and while a clear image is obtained, it becomes possible to mitigate displeasure and asthenopia.

[0045] Moreover, it is possible to constitute an image formation means from one liquid crystal panel, a digital mirror device, etc., and since optical system and a circuit system are simplified, a miniaturization and portable improvement are attained. Moreover, the cutback of a manufacturing cost also becomes possible.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the image formation system which forms one color composite image by forming the red image, the blue image, green image, and white image used as a basic image in time amount sequential. Moreover, this invention relates to the projection mold display which adopted such an image formation system.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] In recent years, the projection mold display using a liquid crystal panel is known, and the many use three liquid crystal panels. After a dichroic mirror's separating into red light, green light, and blue glow the light by which outgoing radiation was carried out from the light source and modulating each of such colored light with three liquid crystal panels, he is trying to form an image by compounding with a dichroic mirror or synthetic prism in such a projection mold display. Moreover, that to which portability becomes important like a head wearing mold display forms one color composite image by arranging a red filter, a green filter, and a blue filter with sufficient balance corresponding to each pixel of a liquid crystal panel, and modulating the light which penetrates these filters by each pixel.
[0003] Furthermore, while using the image formation panel of a reflective mold called a digital micro mirror device (DMD) instead of the liquid crystal panel mentioned above, the projection mold display adapting the Digital Light Processing (DLP) technique which Texas Instruments, Inc. has proposed is also proposed. This projection mold indicating equipment transposes the liquid crystal panel mentioned above to a digital micro mirror device, and the method of forming a color composite image is the same as the projection mold indicating equipment and basic target using the liquid crystal panel described previously. Moreover, the projection mold display using one digital micro mirror device is also proposed. Such a projection mold display is equipped with the rotor plate type light filter with which the red filter, the green filter, and the blue filter were formed, forms the colored light of three colors with these filters, and forms a red image, a green image, and a blue image by making it synchronize with the timing to which each colored light is supplied by the digital micro mirror device, and performing an image processing.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] As more than explained, in the image formation system list of this invention in a projection mold display By performing image formation in order of reverse with the sequence by which image composition processing is carried out by the cerebrum in view of the physiological mechanism that image composition processing is carried out in time amount sequential in order of a red image, a green image, and a blue image on an observer's own high order cerebrum level The image of three colors which form one synthetic image is made to be compounded by the cerebrum as simultaneous as possible. Therefore, false coutour, color gap, etc. are mitigable, and while a clear image is obtained, it becomes possible to mitigate displeasure and asthenopia. [0045] Moreover, it is possible to constitute an image formation means from one liquid crystal panel, a digital mirror device, etc., and since optical system and a circuit system are simplified, a miniaturization and portable improvement are attained. Moreover, the cutback of a manufacturing cost also becomes possible.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] A projection mold indicating equipment is a tool very convenient to indicate data and the image by the big screen in presentations, such as a board and a lecture meeting. However, in the projection mold display mentioned above, in order to use three liquid crystal panels, and since optical system and a circuit system are complicated in connection with using three liquid crystal panels, it is very expensive. Moreover, although the image is formed with one liquid crystal panel equipped with the light filter in the head wearing mold display, in order to have to form in the combination of three pixels equipped with the light filter which supplies colored light which is mutually different in one picture element, resolution will fall.
[0005] Furthermore, the projection mold display which used three digital micro mirror devices (DMD) is several times as expensive as the projection mold display which used three liquid crystal panels instead of the liquid crystal panel. Moreover, since low-pricing can realize the projection mold indicating equipment using one digital micro mirror device to some extent, the application to television is also fully considered. However, in the actual condition, since the configuration of a rotor plate type light filter is inadequate, problems in formation of a dynamic image, such as false coutour and color gap, are not solved.
[0006] This invention aims at solving the problem which such a conventional technique has.

[Translation done.]

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MEANS

[Means for Solving the Problem] The artificer of this invention inquired about the physiology brain [an eye and a brain] problem, extracted the requirements with which a projection mold display should be equipped, and resulted in completion of this invention.
[0008] A colored light supply means by which the image formation system of this invention 1st supplies blue glow, green light, red light, and the white light to this order in time amount sequential, Said blue glow supplied by said colored light supply means, said green light, said red light, It has an image formation means to form the image corresponding to said white light based on the image information synchronized with said each colored light, and is characterized by coming to form an image in order of a blue image, green image, and red image and a white image in time amount sequential.
[0009] People's retina structure is shown in drawing 9. On people's retina, the visual cell of two kinds of being called the cone cell which recognizes a color and a form, and the rod cell which reacts to brightness sensitively exists. It results in a ganglion cell through some paths, and it becomes an optic nerve fiber eventually, and converges on the optic-disk section, and these cells are left out of an eyeball as an optic nerve. An optic nerve fiber is divided into three fiber groups from which a size is different in this process. The thickest nerve-fiber group has the quickest speed of response to a luminous stimulus, the thinnest nerve-fiber group has the slowest speed of response to a luminous stimulus, and the nerve-fiber group of a medium serves as a middle speed of response of the thickest fiber group and the thinnest fiber group to the luminous stimulus. Moreover, as for blue and the nerve-fiber group of a medium, the nerve-fiber group with these thickest nerve-fiber groups tells the information that red and the thinnest nerve-fiber group are green (303 H. - T.Change:J.Neurophysiol., 19,224- 231, 1953, KMotokawa :J.Neurophysiol., 12,289- 1949). From the above thing, he can understand that the information on a color is red and the green and blue mechanism told to the visual center of a cerebrum in time amount sequential.
[0010] He is trying to be compounded by the cerebrum by the image formation system of this invention in view of the physiological mechanism that image composition processing is carried out in time amount sequential in order of a red image, a green image, and a blue image on an observer's own high order cerebrum level, as simultaneously [the image of three colors which form one synthetic image by performing image formation in order of reverse] with the sequence by which image composition processing is carried out by the cerebrum as possible. Therefore, false coutour, color gap, etc. are mitigable, and while a clear image is obtained, it becomes possible to mitigate displeasure and asthenopia.
[0011] When it considers as the configuration equipped with the light filter for generating colored light in the above-mentioned image formation system from the light by which outgoing radiation was carried out from the light source and the light source concerned in the colored light supply means The blue filter for generating blue glow for a light filter, and the green filter for generating green light, It considers as the configuration equipped with the red filter for generating red light, and the filter for white for generating the white light. If it is made to pass the light by which outgoing radiation was carried out from the light source in order of a blue filter, green filter, and red filter and the filter for white, it will become possible in time amount sequential to supply blue glow, green light, red light, and the white light to this order. In addition, the thing and transparence filter of the configuration which makes the light by which outgoing radiation was carried out from the light source penetrate as it is, i.e., a configuration of that only this part does not prepare a filter, are also contained in the filter White for white.
[0012] Moreover, in the above-mentioned image formation system, it is good also as a configuration equipped with the light source for red which supplies red light for a colored light supply means, the light source for green which supplies green light, the light source for blue which supplies blue glow, and **. In this case, blue glow, green light, red light, and the white light are supplied to this order in time amount sequential the light source for blue, the light source for green, the light source for red, and by making this order turn on the light source altogether.

[0013] A colored light supply means to generate a predetermined protection-from-light period between the period which the image formation system of this invention 2nd supplies blue glow, green light, red light, and the white light in time amount sequential, and supplies said white light, and the period which supplies said blue glow, Said blue glow supplied by said colored light supply means, said green light, said red light, It has an image formation means to form the image corresponding to said white light based on the image information synchronized with said each colored light, and is characterized by coming to form an image in order of a blue image, green image, and red image and a white image in time amount sequential.
[0014] Also by the image formation system of this invention 2nd, the same effectiveness as the 1st image formation system mentioned above can be acquired. Moreover, according to the 2nd image formation system, by establishing a protection-from-light period, the after-image of a blue image [which was formed before the protection-from-light period], green image, and red image and a white image can be eliminated, and it becomes possible to obtain a still clearer image.
[0015] When it considers as the configuration equipped with the light filter for generating colored light in the image formation system of the above 2nd from the light by which outgoing radiation was carried out from the light source and the light source concerned in the colored light supply means The blue filter for generating blue glow for a light filter, and the green filter for generating green light, The red filter for generating red light, and the filter for white for generating the white light, If it is made to make it pass in order of a blue filter, green filter, and red filter, the filter for white, and a protection-from-light filter, the light by which considered as the configuration equipped with the protection-from-light filter for generating a protection-from-light period, and outgoing radiation was carried out from the light source In time amount sequential, while supplying blue glow, green light, red light, and the white light to this order, a protection-from-light period is generable. In addition, the thing and transparence filter of the configuration which makes the light by which outgoing radiation was carried out from the light source penetrate as it is, i.e., a configuration of that only this part does not prepare a filter, are also contained in the filter White for white.
[0016] Moreover, the light source for red which supplies red light for said colored light supply means in the image formation system of the above 2nd, When it considers as the configuration equipped with the light source for green which supplies green light, the light source for blue which supplies blue glow, and ** By establishing the period which makes all the light sources switch off between the period which makes this order turn on the light source for blue, the light source for green, the light source for red, and all the light sources, and makes all the light sources turn on, and the period which makes the light source for blue turn on In time amount sequential, while supplying blue glow, green light, red light, and the white light to this order, a protection-from-light period is generable.
[0017] The projection mold display of this invention is characterized by having a projection means to project the light by which outgoing radiation was carried out from an above-mentioned image formation system and this above-mentioned image formation system. Since the projection mold display of this invention is equipped with the above-mentioned image formation system, it can possess itself of the effectiveness by each above-mentioned image formation system. Furthermore, it is possible to constitute an image formation means from one liquid crystal panel, a digital mirror device, etc., and since optical system and a circuit system are simplified, a miniaturization and portable improvement are attained. Moreover, the cutback of a manufacturing cost also becomes possible.
[0018]
[Embodiment of the Invention] With reference to a drawing, the gestalt of suitable operation of this invention is explained below.
[0019] (1st operation gestalt) Drawing 1 is the image formation system of this invention, and the schematic diagram showing the 1st operation gestalt of a projection mold display in a list.
[0020] The projection mold display 30 is equipped with the image formation system 20 and the projection lens 10 as a projection means to project the light by which outgoing radiation was carried out from the image formation system 20.
[0021] The image formation system 20 has a colored light supply means 21 to supply red light, blue glow, green light, and the white light, and an image formation means 22 to form the image corresponding to the colored light supplied from the colored light supply means 21 based on image information.
[0022] The colored light supply means 21 is equipped with the light filter 1 for generating red light, blue glow, green light, and the white light in time amount sequential from the light by which outgoing radiation was carried out from the light source 2 and the light source 2, and the lens 3 which outgoing radiation is carried out from the light source 2, and makes light which passed the light filter 1 abbreviation parallel light. The image formation means 22 is equipped with the polarizing plate 4, the reflective mirror 5, the liquid crystal panel 6, and the polarizing plate 7. The colored light generated in time amount sequential from the color supply means 21 passes a

polarizing plate 4, it is reflected by the reflective mirror 5 and only a predetermined polarization light carries out incidence of it to a liquid crystal panel 6. A liquid crystal panel 6 is a liquid crystal panel of the reflective mold to which the light which carried out incidence is modulated and outgoing radiation of the modulated light is carried out as the reflected light. The light reflected by the liquid crystal panel 6 passes the polarizing plate 7 arranged in the optical path of the reflected light, and amplification projection only of the predetermined polarization light is carried out with the projection lens 10.

[0023] Here, a light filter 1 is a rotor plate type light filter equipped with the filter White for white for generating the red filter R and the white light for generating the green filter G and red light for generating the blue filter B and green light for generating blue glow, as shown in drawing 2 (a). And these filters are arranged so that the light from the light source may pass the blue filter B, the green filter G, the red filter R, and the filter White for white in this order. Therefore, from a colored light supply means, blue glow, green light, red light, and the white light will be supplied to this order in time amount sequential. On the other hand, in time amount sequential, to a liquid crystal panel 6, the image information of blue glow, the image information of green light, the image information of red light, and the image information of the white light are supplied, and a liquid crystal panel modulates light from the image information supply means which is not illustrated to it based on such image information. Such image information makes it synchronize with supply of blue glow, green light, blue glow, and the white light, and is supplied. Therefore, a blue image [which constitutes one color composite image from one revolution (in view of a light source side counterclockwise rotation) of a light filter 1], green image, and red image, and a white image can be formed in this order in time amount sequential.

[0024] He is trying to be compounded as simultaneously [the image of three colors which form one synthetic image by performing image formation in order of reverse] with the sequence by which image composition processing is carried out in this way by the cerebrum in view of the physiological mechanism that image composition processing is carried out in time amount sequential in order of a red image, a green image, and a blue image on an observer's own high order cerebrum level as possible by the image formation system 20 list of this example by the cerebrum with the projection mold indicating equipment 30. Therefore, false coutour, color gap, etc. are mitigable, and while a clear image is obtained, it becomes possible to mitigate displeasure and asthenopia.

[0025] In addition, the filters White for white may be the configuration which makes the light by which outgoing radiation was carried out from the light source 2 penetrate as it is, i.e., the configuration which does not prepare a filter only in this part, and a transparence filter. Therefore, suppose that the thing and transparence filter of a configuration of not preparing a filter in this way are also included in "the filter White for white" in explanation of this operation gestalt, and explanation of the following modifications or an operation gestalt.

[0026] (Modification 1 of a light filter 1) Instead of the light filter 1 mentioned above, the light filter 11 as shown in drawing 2 (b) may be used. A light filter 11 is a rotor plate type light filter equipped with the filter White for white for generating the red filter R and the white light for generating the green filter G and red light for generating the blue filter B and green light for generating blue glow, and the protection-from-light filter Black. And these filters are arranged so that the light from the light source may pass the blue filter B, the green filter G, the red filter R, the filter White for white, and the protection-from-light filter Black in this order. Therefore, from a colored light supply means, in time amount sequential, while blue glow, green light, red light, and the white light are supplied to this order, a predetermined protection-from-light period will be generated between the period which supplies the white light, and the period which supplies blue glow. What is necessary is on the other hand, just to supply the image information of blue glow, the image information of green light, the image information of red light, and the image information of the white light to a liquid crystal panel 6 in time amount sequential like the case of the operation gestalt described previously. The image information supplied at a protection-from-light period is arbitrary.

[0027] The effectiveness same in the image formation system 20 list concerning the operation gestalt which also mentioned the projection mold display above in the image formation system list using a light filter 1 like this example as the projection mold display 30 can be acquired. Furthermore, with a projection mold display, by preparing a white image, the improvement in brightness and contrast sensitivity can be raised in the image formation system list using the light filter 1 of this example, and the effectiveness of becoming possible to obtain a still clearer image is in it. Furthermore, by establishing a protection-from-light period, the after-image of a blue image [which was formed before the protection-from-light period], green image, and red image and a white image can be eliminated, and it is effective in becoming possible to obtain a clear image similarly.

[0028] (Modification 2 of a light filter 1) Although the light filter 1 and light filter 11 which were mentioned above are a light filter which supplies colored light for each to form one synthetic image by one revolution, it is also possible to transpose to the light filter which supplies the colored light for forming two or more synthetic images

by one revolution for this.
[0029] Drawing 3 is drawing showing the example of the rotor plate type light filter which supplies the colored light for forming two synthetic images by one revolution.
[0030] The light filter 12 shown in drawing 3 (a) is equipped with the blue filter B, the green filter G, the red filter R, and every two filters White each for white. Moreover, these filters are arranged so that the light from the light source may pass the blue filter B, the green filter G, the red filter R, and the filter White for white in this order. Therefore, from a colored light supply means, blue glow, green light, red light, and the white light will be supplied to this order in time amount sequential. Like the case of the operation gestalt previously stated to the liquid crystal panel 6, in time amount sequential, if the image information of blue glow, the image information of green light, the image information of red light, and the image information of the white light are supplied, a blue image [which constitutes two color composite images from one revolution (in view of a light source side counterclockwise rotation) of a light filter 12], green image, and red image, and a white image can be formed in this order in time amount sequential.
[0031] Furthermore, the light filter 13 shown in drawing 3 (b) is equipped with the blue filter B, the green filter G, the red filter R, the filter White for white, and every two protection-from-light filters Black each. And these filters are arranged so that the light from the light source may pass the blue filter B, the green filter G, the red filter R, the filter White for white, and the protection-from-light filter Black in this order. Therefore, from a colored light supply means, in time amount sequential, while blue glow, green light, red light, and the white light are supplied to this order, a predetermined protection-from-light period will be generated between the period which supplies the white light, and the period which supplies blue glow. Like the case of the operation gestalt previously stated to the liquid crystal panel 6, in time amount sequential, if the image information of blue glow, the image information of green light, the image information of red light, and the image information of the white light are supplied, a blue image [which constitutes two color composite images from one revolution (in view of a light source side counterclockwise rotation) of a light filter 12], green image, and red image, and a white image can be formed in this order in time amount sequential. The image information supplied at a protection-from-light period is arbitrary.
[0032] Thus, the number of the groups (group of blue glow, green light, red light, and the white light) of the colored light which can be supplied to per revolution of a rotor plate type light filter can be set as arbitration by changing the number of combination of the filter of each color containing a protection-from-light filter.
[0033] (2nd operation gestalt) Drawing 4 is the image formation system of this invention, and the schematic diagram showing the 2nd operation gestalt of a projection mold display in a list. This operation gestalt differs from the 1st operation gestalt mentioned above in that the reflective mirror 5 (refer to drawing 1) for carrying out incidence of the light to the point and liquid crystal panel which are a liquid crystal panel of the transparency mold which makes the transmitted light light by which the liquid crystal panel was modulated, and carries out outgoing radiation is not used. About other points, since it is the same as that of the 1st operation gestalt mentioned above, the detailed explanation is omitted. In addition, about the same component as the 1st operation gestalt mentioned above, the same sign as what was used by drawing 1 is used.
[0034] The projection mold display 50 is equipped with the image formation system 40 and the projection lens 10 as a projection means to project the light by which outgoing radiation was carried out from the image formation system 20.
[0035] The image formation system 40 has a colored light supply means 21 to supply red light, blue glow, green light, and the white light, and an image formation means 23 to form the image corresponding to the colored light supplied from the colored light supply means 21 based on image information.
[0036] The colored light supply means 21 is the completely same configuration as the colored light supply means 21 concerning the 1st operation gestalt, and is equipped with the light filter 1 for generating red light, blue glow, green light, and the white light in time amount sequential from the light by which outgoing radiation was carried out from the light source 2 and the light source 2, and the lens 3 which outgoing radiation is carried out from the light source 2, and makes light which passed the light filter 1 abbreviation parallel light. The image formation means 23 is equipped with the polarizing plate 4, the liquid crystal panel 8, and the polarizing plate 7. The colored light generated in time amount sequential from the color supply means 21 passes a polarizing plate 4, and only a predetermined polarization light carries out incidence to a liquid crystal panel 8. A liquid crystal panel 8 is a liquid crystal panel of the transparency mold to which the light which carried out incidence is modulated and outgoing radiation of the modulated light is carried out as the transmitted light. The light reflected by the liquid crystal panel 8 passes the polarizing plate 7 arranged in the optical path of the reflected light, and amplification projection only of the predetermined polarization light is carried out with the projection lens 10.
[0037] Also with the projection mold display 50, the same effectiveness as the 1st operation gestalt mentioned

above can be acquired in the image formation system 40 list of this operation gestalt. In addition, of course, it is also possible to adopt the light filters 11, 12, and 13 as shown in drawing 2 (b), drawing 3 (a), and drawing 3 R> 3 (b) instead of the light filter 1 of this operation gestalt.

[0038] (Modification of the colored light supply means 21) the colored light supply means 21 in the 1st operation gestalt and the 2nd operation gestalt which were mentioned above -- the light source and a rotor plate-type light filter -- time order -- although it was degree thing which supplies the colored light of three colors of blue glow, green light, and red light, and the colorless white light-like, this can also be transposed to the colored light supply means 24 as shown in drawing 5 .

[0039] The colored light supply means 24 shown in drawing 5 is equipped with red light emitting diode 25R as the light source for red for supplying green light emitting diode 25G and red light as blue light emitting diode 25B as the light source for blue for supplying blue glow, and the light source for green for supplying green light. The electrical signals 27B, 27G, and 27R as shown through Terminals 26B, 26G, and 26R at drawing 6 (a), respectively are supplied to the light emitting diodes 25B, 25G, and 25R of each color. As for blue light emitting diode 25B, only the standup period of electrical signal 27B is turned on, as for green light emitting diode 25G, only the standup period of electrical signal 27G is turned on, and, as for red light emitting diode 25R, only the standup period of electrical signal 27R is turned on. Therefore, each light emitting diode will be turned on in time amount sequential by order called blue light emitting diode 25B, green light emitting diode 25G, and red light emitting diode 25R and all the light emitting diodes 25B, 25G, and 25R, and blue glow, green light, red light, and the white light will be supplied to an image formation means at this order. If such a colored light supply means 24 is used, the effectiveness same in the image formation system list which adopted the light filters 1 and 12 shown in drawing 2 (a) and drawing 3 (a) as a projection mold display can be acquired.

[0040] Furthermore, what is necessary is just to supply the electrical signals 28B, 28G, and 28R as shown in Terminals 26B, 26G, and 26R at drawing 6 (b) like the light filters 11 and 13 shown in drawing 2 (b) and drawing 3 (b), in order to supply a protection-from-light period. In the electrical signal shown in drawing 6 (b), the period t2 which makes all light emitting diodes switch off between the period t1 which makes all the light emitting diodes 27B, 27G, and 27R turn on simultaneously, and the period t3 which makes blue light emitting diode 27B turn on is established. Therefore, in time amount sequential, while blue glow, green light, red light, and the white light are supplied to this order, a protection-from-light period is generated between the period when the white light is supplied, and the period when blue glow is supplied. If such a colored light supply means 24 is used, the effectiveness same in the image formation system list which adopted the light filters 11 and 13 shown in drawing 2 (b) and drawing 3 (b) as a projection mold display can be acquired.

[0041] In addition, fluorescence tubing, a neon tube, a high-pressure mercury-vapor lamp, a plasma fluorescent substance, electroluminescence, the laser light source, etc. may be used instead of light emitting diode.

[0042] (Other operation gestalten) The configuration of the projection mold display concerning an above-mentioned operation gestalt is applicable to all of the projection mold display of a rear mold that perform projection from an opposite side with the side which observes the projection mold display and projection side of the front mold which performs projection from the side which observes a projection side.

[0043] Moreover, a digital micro mirror device (DMD) is also employable instead of the liquid crystal panel 6 (refer to drawing 1) of the reflective mold concerning the 1st operation gestalt. In addition, when a digital macro mirror device is adopted, polarizing plates 4 and 7 become unnecessary.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The schematic diagram showing the 1st operation gestalt of this invention.
[Drawing 2] The top view showing the light filter 1 in drawing 1 , and its modification.
[Drawing 3] The top view showing the modification of a light filter 1.
[Drawing 4] The schematic diagram showing the 2nd operation gestalt of this invention.
[Drawing 5] Drawing showing the modification of the colored light supply means 21 in drawing 1 or drawing 4 .
[Drawing 6] Drawing showing the electrical signal supplied to the colored light supply means 21 of drawing 5 .
[Drawing 7] Drawing explaining people's retina structure.
[Description of Notations]
1 Light Filter
2 Light Source
3 Condenser Lens
4 Polarizing Plate
5 Reflective Mirror
6 Liquid Crystal Panel
7 Polarizing Plate
8 Liquid Crystal Panel
10 Projection Lens
11, 12, 13 Light filter
20 Image Formation System
21 Colored Light Supply Means
22 Image Formation Means
23 Image Formation Means
24 Colored Light Supply Means
25R, 25G, 25B Light emitting diode
26R, 26G, 26B Terminal
27R, 27G, 27B, 28R, 28G, 28B Electrical signal
30 Projection Mold Display
40 Image Formation System
50 Projection Mold Display

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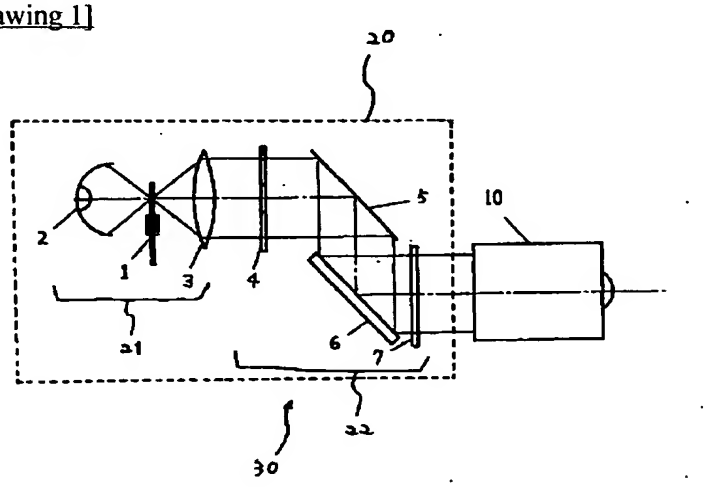
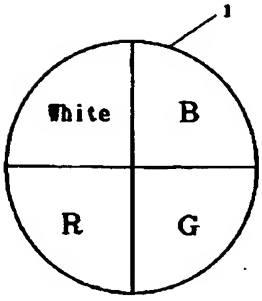
DRAWINGS

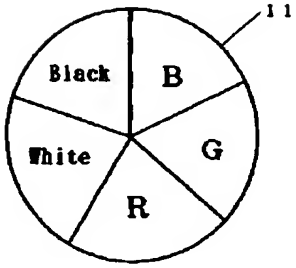
[Drawing 1]



[Drawing 2]

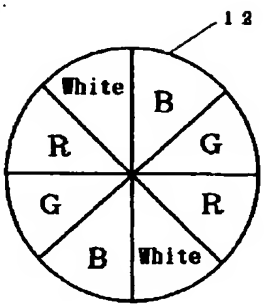


(a)

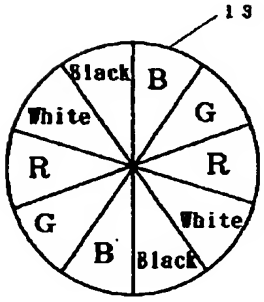


(b)

[Drawing 3]

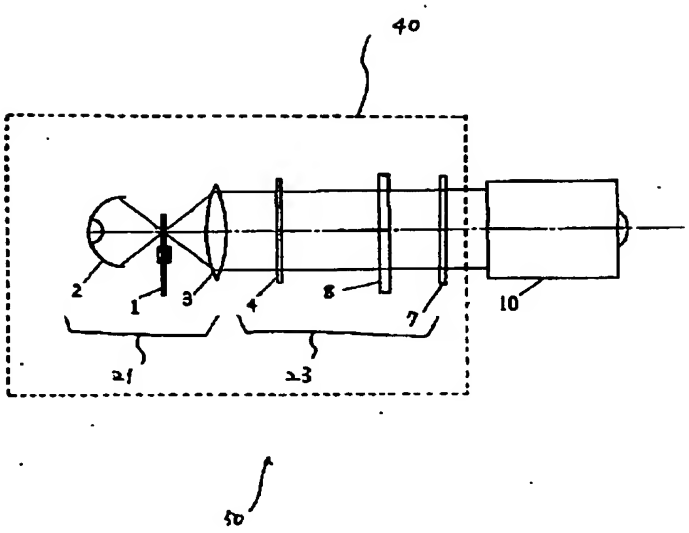


(a)

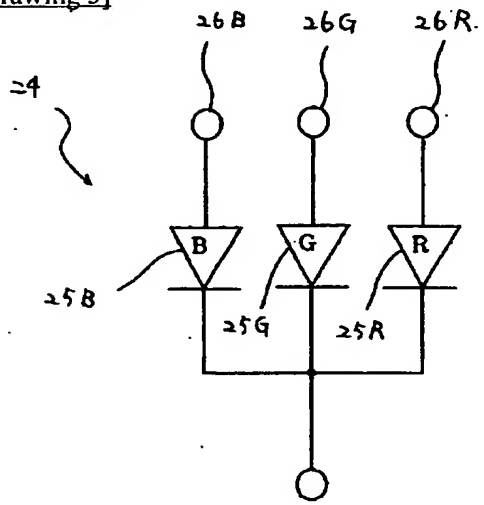


(b)

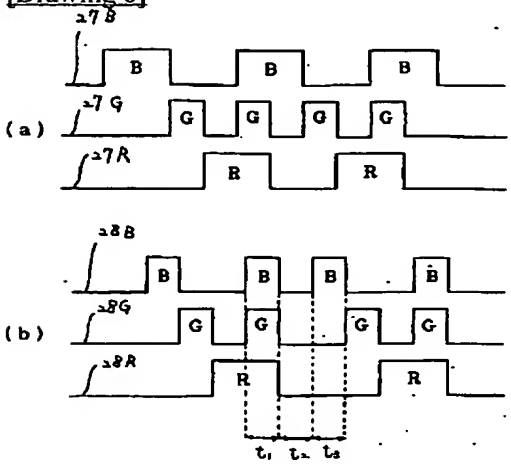
[Drawing 4]



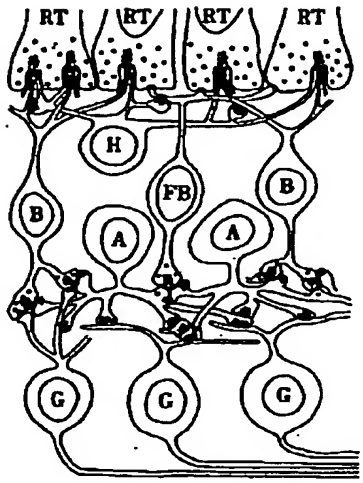
[Drawing 5]



[Drawing 6]



[Drawing 7]



有椎動物網膜の網膜細結合模式図 (Dowling, 1970)

RT：視細胞，H：水平細胞，BとFB：双極細胞，A：アマクリン細胞，G：神経節細胞．

[Translation done.]

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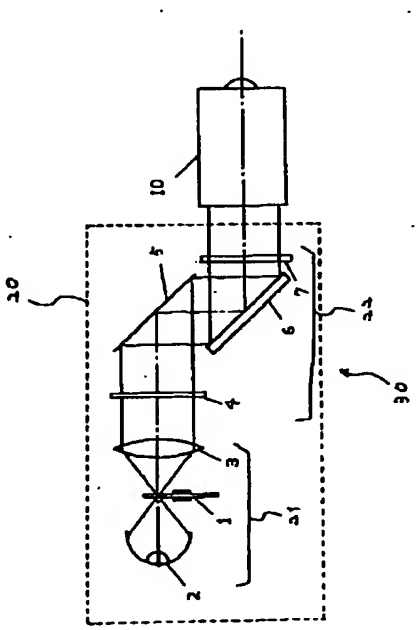
(54)【発明の名称】　画像形成システムおよび投写型表示装置

(57)【要約】

【課題】　合成画像形成時に生じる偽輪郭や色ズレを解消する。

【解決手段】　画像形成システム２０は、色光供給手段２１と画像形成手段２２とを有している。色光供給手段２１からは、時間順次的に、青色光、緑色光、赤色光、白色光がこの順に供給され、画像形成手段２２では、供給される各色光と同期して１つのカラー合成画像を構成する青色画像、緑色画像、赤色画像、白色画像を、時間順次的に、この順に形成する。このように、大脳で画像合成処理される順番とは逆の順番で画像形成を行うことにより、１つの合成画像を形成する３色の画像がなるべく同時に大脳で合成されるようにしている。従って、偽輪郭や色ズレ等を軽減することができ、鮮明な像が得られるとともに不快感や眼精疲労を軽減することが可能となる。



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【特許請求の範囲】

【請求項１】　時間順次的に、青色光、緑色光、赤色光、白色光をこの順に供給する色光供給手段と、

前記色光供給手段によって供給された前記青色光、前記緑色光、前記赤色光、前記白色光に対応した画像を、それぞれの前記色光と同期させた画像情報に基づいて形成する画像形成手段とを有し、

時間順次的に、青色画像、緑色画像、赤色画像、白色画像の順に画像が形成されてなることを特徴とする画像形成システム。

【請求項２】　請求項１記載の画像形成システムにおいて、

前記色光供給手段は、光源と、前記光源から出射された光から前記色光を生成するためのカラーフィルタとを備え、

前記カラーフィルタは、前記青色光を生成するための青色フィルタと、前記緑色光を生成するための緑色フィルタと、前記赤色光を生成するための赤色フィルタ、前記白色光を生成するための白色用フィルタとを備え、

前記光源からの光が、前記青色フィルタ、前記緑色フィルタ、前記赤色フィルタ、前記白色用フィルタをこの順に通過することにより、時間順次的に、前記青色光、前記緑色光、前記赤色光、前記白色光がこの順に供給されてなることを特徴とする画像形成システム。

【請求項３】　請求項１記載の画像形成システムにおいて、

前記色光供給手段は、前記赤色光を供給する赤色用光源と、前記緑色光を供給する緑色用光源と、前記青色光を供給する青色用光源とを備え、

前記青色用光源、前記緑色用光源、前記赤色用光源、すべての前記光源をこの順に点灯させることにより、時間順次的に、青色光、緑色光、赤色光、白色光がこの順に供給されてなることを特徴とする画像形成システム。

【請求項４】　時間順次的に、青色光、緑色光、赤色光、白色光を供給し、かつ前記白色光を供給する期間と前記青色光を供給する期間との間に所定の遮光期間を生成する色光供給手段と、

前記色光供給手段によって供給された前記青色光、前記緑色光、前記赤色光、前記白色光に対応した画像を、それぞれの前記色光と同期させた画像情報に基づいて形成する画像形成手段とを有し、

時間順次的に、青色画像、緑色画像、赤色画像、白色画像の順に画像が形成されてなることを特徴とする画像形成システム。

【請求項５】　請求項４記載の画像形成システムにおいて、

前記色光供給手段は、光源と、前記光源から出射された光から前記色光を生成するためのカラーフィルタとを備え、

前記カラーフィルタは、前記青色光を生成するための青色フィルタと、前記緑色光を生成するための緑色フィルタと、前記赤色光を生成するための赤色フィルタと、前記白色光を生成するための白色用フィルタと、前記遮光期間を生成するための遮光フィルタとを備え、

前記光源からの光が、前記青色フィルタ、前記緑色フィルタ、前記赤色フィルタ、前記白色用フィルタをこの順に通過することにより、時間順次的に、前記青色光、前記緑色光、前記赤色光、前記白色光がこの順に供給されるとともに、前記遮光期間が生成されてなることを特徴とする画像形成システム。

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【請求項６】　請求項４記載の画像形成システムにおいて、

前記色光供給手段は、前記赤色光を供給する赤色用光源と、前記緑色光を供給する緑色用光源と、前記青色光を供給する青色用光源とを備え、

前記青色用光源、前記緑色用光源、前記赤色用光源、すべての前記光源をこの順に点灯させ、かつ前記白色用光源を点灯させる期間と前記青色用光源を点灯させる期間との間に前記光源をすべて消灯させる期間を設けることにより、時間順次的に、前記青色光、前記緑色光、前記赤色光、前記白色光がこの順に供給されるとともに、前記遮光期間が生成されてなることを特徴とする画像形成システム。

【請求項７】　請求項１乃至６のいずれかに記載の画像形成システムと、

前記画像形成システムから出射された光を投写する投写手段とを備えたことを特徴とする投写型表示装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、基本画像となる赤色画像と青色画像と緑色画像と白色画像とを、時間順次的に形成することによって１つのカラー合成画像を形成する画像形成システムに関する。また、本発明はこのような画像形成システムを採用した投写型表示装置に関する。

【０００２】

【従来の技術】近年、液晶パネルを用いた投写型表示装置が知られており、その多くが液晶パネルを３つ使用したものである。このような投写型表示装置では、光源からの出射された光をダイクロイックミラーにより赤色光、緑色光、青色光に分離し、これらの色光のそれぞれを３つの液晶パネルによって変調した後、ダイクロイックミラーまたは合成プリズムにより合成することによって画像を形成するようにしている。また、頭部装着型表示装置のように携帯性が重要になるものは、液晶パネルの各画素に対応して赤色フィルタ、緑色フィルタ、青色フィルタをバランス良く配置し、これらのフィルタを透過する光を各画素で変調することにより、１つのカラー合成画像を形成している。

【０００３】さらに、上述した液晶パネルの代わりに、

デジタルマイクロミラーデバイス（ＤＭＤ）という反射型の画像形成パネルを用いるとともに、テキサスインスツルメンツ社の提案しているDigital Light Processing（ＤＬＰ）技術を応用した投写型表示装置も提案されている。この投写型表示装置は、上述した液晶パネルをデジタルマイクロミラーデバイスに置き換えたものであり、カラー合成画像の形成法は、先に述べた液晶パネルを用いた投写型表示装置と基本的に同じである。また、デジタルマイクロミラーデバイスを１つ用いた投写型表示装置も提案されている。このような投写型表示装置は、赤色フィルタ、緑色フィルタ、青色フィルタが形成された回転板式カラーフィルタを備えており、これらのフィルタによって３色の色光を形成し、デジタルマイクロミラーデバイスによって各色光が供給されるタイミングと同期させて画像処理を行うことによって赤色画像、緑色画像、青色画像を形成するものである。

【０００４】

【発明が解決しようとする課題】投写型表示装置は、会議や講演会などのプレゼンテーションにおいてデータや画像を大画面表示するのに非常に便利なツールである。しかしながら、上述した投写型表示装置では、３つの液晶パネルを用いるため、また、３つの液晶パネルを用いることに伴い光学系や回路系が複雑化してしまうため、非常に高価なものになっている。また、頭部装着型表示装置では、カラーフィルタを備えた１つの液晶パネルで画像を形成しているが、１つの絵素を、互いに異なる色光を供給するカラーフィルタを備えた３つの画素の組み合わせで形成しなければならないため、解像度が低下してしまう。

【０００５】さらに、液晶パネルの代わりに、デジタルマイクロミラーデバイス（ＤＭＤ）を３つ用いた投写型表示装置は、液晶パネルを３つ用いた投写型表示装置よりも数倍高価なものとなっている。また、デジタルマイクロミラーデバイスを１つ用いた投写型表示装置は、ある程度低価格化が実現できるため、テレビジョンへの応用も十分に考えられる。しかしながら、現状では、回転板式カラーフィルタの構成が不十分であるために、動画像の形成における偽輪郭や色ズレなどの問題が解消されていない。

【０００６】本発明は、このような従来技術の有する問題を解消することを目的とする。

【０００７】

【課題を解決するための手段】本発明の発明者は、眼および脳の生理学な問題について研究し、投写型表示装置が備えるべき要件を抽出し、本発明の完成に至った。

【０００８】本発明第１の画像形成システムは、時間順次的に、青色光、緑色光、赤色光、白色光をこの順に供給する色光供給手段と、前記色光供給手段によって供給された前記青色光、前記緑色光、前記赤色光、前記白色光に対応した画像を、それぞれの前記色光と同期させた画像情報に基づいて形成する画像形成手段とを有し、時間順次的に、青色画像、緑色画像、赤色画像、白色画像の順に画像が形成されてなることを特徴とする。

【０００９】図９に人の網膜構造を示す。人の網膜上には、色や形を見分ける錐体細胞と、明るさに敏感に反応する桿体細胞といわれるの２種類の視細胞が存在する。これらの細胞は、幾つかの経路を経て神経節細胞に至り、最終的には視神経線維となって視神経乳頭部に収束され、視神経として眼球外へ出ていく。この過程の中で、視神経線維は太さの違う３つの線維群に分かれる。最も太い神経線維群は、光刺激に対する応答速度がもっとも速く、最も細い神経線維群は光刺激に対する応答速度がもっとも遅く、中位の神経線維群は、光刺激に対して最も太い線維群と最も細い線維群の中間の応答速度となっている。また、これらの神経線維群は、最も太い神経線維群は赤色、最も細い神経線維群は青色、中位の神経線維群は緑色の情報を伝える（H.-T.Change:J.Neurophysiol.,19,224-231,1953、K.Motokawa :J.Neurophysiol.,12,289-303,1949）。以上のことから、色の情報は、赤色、緑色、青色の時間順次的に大脳の視覚中枢に伝えられるメカニズムになっていることが理解できる。

【００１０】本発明の画像形成システムでは、観察者自身の高次大脳レベルで赤色画像、緑色画像、青色画像の順に、時間順次的に画像合成処理されるという生理的メカニズムに鑑み、大脳で画像合成処理される順番とは逆の順番で画像形成を行うことにより、１つの合成画像を形成する３色の画像がなるべく同時に大脳で合成されるようにしている。従って、偽輪郭や色ズレ等を軽減することができ、鮮明な像が得られるとともに不快感や眼精疲労を軽減することが可能となる。

【００１１】上記の画像形成システムにおいて、色光供給手段を、光源と、当該光源から出射された光から色光を生成するためのカラーフィルタとを備えた構成とした場合には、カラーフィルタを、青色光を生成するための青色フィルタと、緑色光を生成するための緑色フィルタと、赤色光を生成するための赤色フィルタと、白色光を生成するための白色用フィルタとを備えた構成とし、光源から出射された光を、青色フィルタ、緑色フィルタ、赤色フィルタ、白色用フィルタの順に通過させるようにすれば、時間順次的に、青色光、緑色光、赤色光、白色光をこの順に供給することが可能となる。なお、白色用フィルタWhiteには、光源から出射された光をそのまま透過させる構成、すなわち、この部分だけフィルタを設けない構成のものや透明フィルタも含まれる。

【００１２】また、上記の画像形成システムにおいて、色光供給手段を、赤色光を供給する赤色用光源と、緑色光を供給する緑色用光源と、青色光を供給する青色用光源ととを備えた構成としても良い。この場合には、青色用光源、緑色用光源、赤色用光源、すべて光源をこの順に点灯させることにより、時間順次的に、青色光、緑色

光、赤色光、白色光がこの順に供給される。

【００１３】本発明第２の画像形成システムは、時間順次的に、青色光、緑色光、赤色光、白色光を供給し、かつ前記白色光を供給する期間と前記青色光を供給する期間との間に所定の遮光期間を生成する色光供給手段と、前記色光供給手段によって供給された前記青色光、前記緑色光、前記赤色光、前記白色光に対応した画像を、それぞれの前記色光と同期させた画像情報に基づいて形成する画像形成手段とを有し、時間順次的に、青色画像、緑色画像、赤色画像、白色画像の順に画像が形成されてなることを特徴とする。

【００１４】本発明第２の画像形成システムによっても、前述した第１の画像形成システムと同様の効果を得ることができる。また、第２の画像形成システムによれば、遮光期間を設けることにより、遮光期間前に形成された青色画像、緑色画像、赤色画像、白色画像の残像を消去することができ、さらに鮮明な画像を得ることが可能となる。

【００１５】上記第２の画像形成システムにおいて、色光供給手段を、光源と、当該光源から出射された光から色光を生成するためのカラーフィルタとを備えた構成とした場合には、カラーフィルタを、青色光を生成するための青色フィルタと、緑色光を生成するための緑色フィルタと、赤色光を生成するための赤色フィルタと、白色光を生成するための白色用フィルタと、遮光期間を生成するための遮光フィルタとを備えた構成とし、光源から出射された光を、青色フィルタ、緑色フィルタ、赤色フィルタ、白色用フィルタ、遮光フィルタの順に通過させるようにすれば、時間順次的に、青色光、緑色光、赤色光、白色光をこの順に供給するとともに、遮光期間を生成することができる。なお、白色用フィルタWhiteには、光源から出射された光をそのまま透過させる構成、すなわち、この部分だけフィルタを設けない構成のものや透明フィルタも含まれる。

【００１６】また、上記第２の画像形成システムにおいて、前記色光供給手段を、赤色光を供給する赤色用光源と、緑色光を供給する緑色用光源と、青色光を供給する青色用光源ととを備えた構成とした場合には、青色用光源、緑色用光源、赤色用光源、すべての光源をこの順に点灯させ、かつすべての光源を点灯させる期間と青色用光源を点灯させる期間との間に光源をすべて消灯させる期間を設けることにより、時間順次的に、青色光、緑色光、赤色光、白色光をこの順に供給するとともに、遮光期間を生成することができる。

【００１７】本発明の投写型表示装置は、上記の画像形成システムと、この画像形成システムから出射された光を投写する投写手段とを備えたことを特徴とする。本発明の投写型表示装置は、上記の画像形成システムを備えているので、上記の各画像形成システムによる効果を享有することが可能である。さらに、画像形成手段を１つの液晶パネル、デジタルミラーデバイス等で構成することが可能であり、光学系、回路系が単純化されるために、小型化、携帯性の向上が可能となる。また、製造コストの削減も可能となる。

【００１８】

【発明の実施の形態】以下に図面を参照して本発明の好適な実施の形態について説明する。

【００１９】（第１の実施形態）図１は、本発明の画像形成システム、並びに投写型表示装置の第１の実施形態を示す概略図である。

【００２０】投写型表示装置３０は、画像形成システム２０と、画像形成システム２０から出射された光を投写する投写手段としての投写レンズ１０とを備えている。

【００２１】画像形成システム２０は、赤色光、青色光、緑色光、白色光を供給する色光供給手段２１と、色光供給手段２１から供給された色光に対応した画像を画像情報に基づいて形成する画像形成手段２２とを有している。

【００２２】色光供給手段２１は、光源２と、光源２から出射された光から赤色光、青色光、緑色光、白色光を時間順次的に生成するためのカラーフィルタ１と、光源２から出射され、カラーフィルタ１を通過した光を略平行光とするレンズ３とを備えている。画像形成手段２２は、偏光板４と、反射ミラー５と、液晶パネル６と、偏光板７とを備えている。色供給手段２１から時間順次的に生成された色光は、偏光板４を通過し、所定の偏光光のみが反射ミラー５によって反射されて液晶パネル６に入射する。液晶パネル６は、入射した光を変調し、変調された光を反射光として出射させる反射型の液晶パネルである。液晶パネル６によって反射された光は、反射光の光路中に配置された偏光板７を通過し、所定の偏光光のみが投写レンズ１０によって拡大投写される。

【００２３】ここで、カラーフィルタ１は、図２(a)に示すように、青色光を生成するための青色フィルタＢと、緑色光を生成するための緑色フィルタＧと、赤色光を生成するための赤色フィルタＲと、白色光を生成するための白色用フィルタWhiteとを備えた回転板式カラーフィルタである。そして、これらのフィルタは、光源からの光が、青色フィルタＢ、緑色フィルタＧ、赤色フィルタＲ、白色用フィルタWhiteをこの順に通過するように配置されている。従って、色光供給手段からは、時間順次的に、青色光、緑色光、赤色光、白色光がこの順に供給されることとなる。一方、液晶パネル６には、図示しない画像情報供給手段から、時間順次的に、青色光の画像情報、緑色光の画像情報、赤色光の画像情報、白色光の画像情報が供給され、液晶パネルはこれらの画像情報に基づいて光の変調を行う。これらの画像情報は、青色光、緑色光、青色光、白色光の供給と同期させて供給される。従って、カラーフィルタ１の１回転（光源側からみて反時計まわり）で、１つのカラー合成画像を構成

する青色画像、緑色画像、赤色画像、白色画像を、時間順次的に、この順に形成することができる。

【００２４】本例の画像形成システム２０並びに投写型表示装置３０では、このように、観察者自身の高次大脳レベルで赤色画像、緑色画像、青色画像の順に、時間順次的に画像合成処理されるという生理的メカニズムに鑑み、大脳で画像合成処理される順番とは逆の順番で画像形成を行うことにより、１つの合成画像を形成する３色の画像がなるべく同時に大脳で合成されるようにしている。従って、偽輪郭や色ズレ等を軽減することができ、鮮明な像が得られるとともに不快感や眼精疲労を軽減することが可能となる。

【００２５】なお、白色用フィルタWhiteは、光源２から出射された光をそのまま透過させる構成、すなわち、この部分にだけフィルタを設けない構成や透明フィルタであっても良い。よって、本実施形態の説明ならびに以下の変形例や実施形態の説明において、「白色用フィルタWhite」には、このようにフィルタを設けない構成のものや透明フィルタも含むこととする。

【００２６】（カラーフィルタ１の変形例１）上述したカラーフィルタ１の代わりに、図２(b)に示したようなカラーフィルタ１１を用いても良い。カラーフィルタ１１は、青色光を生成するための青色フィルタＢと、緑色光を生成するための緑色フィルタＧと、赤色光を生成するための赤色フィルタＲと、白色光を生成するための白色用フィルタWhiteと、遮光フィルタBlackとを備えた回転板式カラーフィルタである。そして、これらのフィルタは、光源からの光が、青色フィルタＢ、緑色フィルタＧ、赤色フィルタＲ、白色用フィルタWhite、遮光フィルタBlackをこの順に通過するように配置されている。従って、色光供給手段からは、時間順次的に、青色光、緑色光、赤色光、白色光がこの順に供給されるとともに、白色光を供給する期間と青色光を供給する期間との間には、所定の遮光期間が生成されることとなる。一方、液晶パネル６には、先に述べた実施形態の場合と同様に、時間順次的に、青色光の画像情報、緑色光の画像情報、赤色光の画像情報、白色光の画像情報を供給すれば良い。遮光期間に供給する画像情報は任意である。

【００２７】本例のようなカラーフィルタ１を用いた画像形成システム並びに投写型表示装置でも、前述した実施形態にかかる画像形成システム２０並びに投写型表示装置３０と同様の効果を得ることができる。さらに、本例のカラーフィルタ１を用いた画像形成システム並びに投写型表示装置では、白色画像を設けることにより、明るさの向上およびコントラスト感度を上昇させることができ、さらに鮮明な画像を得ることが可能となるという効果もある。さらに、遮光期間を設けることにより、遮光期間前に形成された青色画像、緑色画像、赤色画像、白色画像の残像を消去することができ、同様に鮮明な画像を得ることが可能となるという効果もある。

【００２８】（カラーフィルタ１の変形例２）前述したカラーフィルタ１、カラーフィルタ１１は、いずれも１回転で１つの合成画像を形成するための色光を供給するカラーフィルタであるが、これを１回転で複数の合成画像を形成するための色光を供給するカラーフィルタに置き換えることも可能である。

【００２９】図３は、１回転で２つの合成画像を形成するための色光を供給する回転板式カラーフィルタの例を示す図である。

【００３０】図３(a)に示したカラーフィルタ１２は、青色フィルタＢ、緑色フィルタＧ、赤色フィルタＲ、白色用フィルタWhiteを各２つずつ備えている。また、これらのフィルタは、光源からの光が、青色フィルタＢ、緑色フィルタＧ、赤色フィルタＲ、白色用フィルタWhiteをこの順に通過するように配置されている。従って、色光供給手段からは、時間順次的に、青色光、緑色光、赤色光、白色光がこの順に供給されることとなる。液晶パネル６に、先に述べた実施形態の場合と同様に、時間順次的に、青色光の画像情報、緑色光の画像情報、赤色光の画像情報、白色光の画像情報を供給すれば、カラーフィルタ１２の１回転（光源側からみて反時計まわり）で、２つのカラー合成画像を構成する青色画像、緑色画像、赤色画像、白色画像を、時間順次的に、この順に形成することができる。

【００３１】さらに、図３(b)に示したカラーフィルタ１３は、青色フィルタＢ、緑色フィルタＧ、赤色フィルタＲ、白色用フィルタWhite、遮光フィルタBlackを各２つずつ備えている。そして、これらのフィルタは、光源からの光が、青色フィルタＢ、緑色フィルタＧ、赤色フィルタＲ、白色用フィルタWhite、遮光フィルタBlackをこの順に通過するように配置されている。従って、色光供給手段からは、時間順次的に、青色光、緑色光、赤色光、白色光がこの順に供給されるとともに、白色光を供給する期間と青色光を供給する期間との間には、所定の遮光期間が生成されることとなる。液晶パネル６に、先に述べた実施形態の場合と同様に、時間順次的に、青色光の画像情報、緑色光の画像情報、赤色光の画像情報、白色光の画像情報を供給すれば、カラーフィルタ１２の１回転（光源側からみて反時計まわり）で、２つのカラー合成画像を構成する青色画像、緑色画像、赤色画像、白色画像を、時間順次的に、この順に形成することができる。遮光期間に供給する画像情報は任意である。

【００３２】このように、回転板式カラーフィルタの、１回転あたりに供給できる色光の組（青色光、緑色光、赤色光、白色光の組）の数は、遮光フィルタを含む各色のフィルタの組み合わせ数を変えることによって、任意に設定することができる。

【００３３】（第２の実施形態）図４は、本発明の画像形成システム、並びに投写型表示装置の第２の実施形態を示す概略図である。本実施形態は、液晶パネルが変調

された光を透過光として出射する透過型の液晶パネルである点、液晶パネルに光を入射させるための反射ミラー５（図１参照）を用いていない点でのみ、前述した第１の実施形態と異なっている。その他の点については、前述した第１の実施形態と同様であるため、その詳細な説明を省略する。なお、前述した第１の実施形態と同様の構成要素については、図１で用いたものと同様の符号を用いる。

【００３４】投写型表示装置５０は、画像形成システム４０と、画像形成システム２０から出射された光を投写する投写手段としての投写レンズ１０とを備えている。

【００３５】画像形成システム４０は、赤色光、青色光、緑色光、白色光を供給する色光供給手段２１と、色光供給手段２１から供給された色光に対応した画像を画像情報に基づいて形成する画像形成手段２３とを有している。

【００３６】色光供給手段２１は、第１の実施形態にかかる色光供給手段２１とまったく同じ構成であり、光源２と、光源２から出射された光から赤色光、青色光、緑色光、白色光を時間順次的に生成するためのカラーフィルタ１と、光源２から出射され、カラーフィルタ１を通過した光を略平行光とするレンズ３とを備えている。画像形成手段２３は、偏光板４と、液晶パネル８と、偏光板７とを備えている。色供給手段２１から時間順次的に生成された色光は、偏光板４を通過し、所定の偏光光のみが液晶パネル８に入射する。液晶パネル８は、入射した光を変調し、変調された光を透過光として出射させる透過型の液晶パネルである。液晶パネル８によって反射された光は、反射光の光路中に配置された偏光板７を通過し、所定の偏光光のみが投写レンズ１０によって拡大投写される。

【００３７】本実施形態の画像形成システム４０並びに投写型表示装置５０によっても、前述した第１の実施形態と同様の効果を得ることができる。なお、本実施形態のカラーフィルタ１の代わりに、図２(b)、図３(a)、図３(b)に示したようなカラーフィルタ１１、１２、１３を採用することも、もちろん可能である。

【００３８】（色光供給手段２１の変形例）上述した第１の実施形態、第２の実施形態における色光供給手段２１は、光源と回転板式のカラーフィルタとによって、時間順次的に青色光、緑色光、赤色光の三色の色光と無色の白色光を供給するものであったが、これを、図５に示したような色光供給手段２４に置き換えることもできる。

【００３９】図５に示した色光供給手段２４は、青色光を供給するための青色用光源としての青色発光ダイオード２５Ｂと、緑色光を供給するための緑色用光源としての緑色発光ダイオード２５Ｇと、赤色光を供給するための赤色用光源としての赤色発光ダイオード２５Ｒとを備えている。各色の発光ダイオード２５Ｂ、２５Ｇ、２５Ｒには、端子２６Ｂ、２６Ｇ、２６Ｒを介して、それぞれ、図６(a)に示すような電気信号２７Ｂ、２７Ｇ、２７Ｒが供給される。青色発光ダイオード２５Ｂは電気信号２７Ｂの立ち上がり期間だけ点灯され、緑色発光ダイオード２５Ｇは電気信号２７Ｇの立ち上がり期間だけ点灯され、赤色発光ダイオード２５Ｒは電気信号２７Ｒの立ち上がり期間だけ点灯される。従って、各発光ダイオードは、青色発光ダイオード２５Ｂ、緑色発光ダイオード２５Ｇ、赤色発光ダイオード２５Ｒ、すべての発光ダイオード２５Ｂ、２５Ｇ、２５Ｒという順に、時間順次的に点灯され、画像形成手段には、青色光、緑色光、赤色光、白色光がこの順に供給されることになる。このような色光供給手段２４を用いれば、図２(a)、図３(a)に示したカラーフィルタ１、１２を採用した画像形成システム並びに投写型表示装置と同様の効果を得ることができる。

【００４０】さらに、図２(b)、図３(b)に示したカラーフィルタ１１、１３のように、遮光期間を供給するためには、端子２６Ｂ、２６Ｇ、２６Ｒに図６(b)に示すような電気信号２８Ｂ、２８Ｇ、２８Ｒを供給すればよい。図６(b)に示す電気信号では、すべての発光ダイオード２７Ｂ、２７Ｇ、２７Ｒを同時に点灯させる期間 t_1 と青色発光ダイオード２７Ｂを点灯させる期間 t_3 との間に、すべての発光ダイオードを消灯させる期間 t_2 が設けられている。従って、時間順次的に、青色光、緑色光、赤色光、白色光がこの順に供給されるとともに、白色光が供給される期間と青色光が供給される期間との間には遮光期間が生成される。このような色光供給手段２４を用いれば、図２(b)、図３(b)に示したカラーフィルタ１１、１３を採用した画像形成システム並びに投写型表示装置と同様の効果を得ることができる。

【００４１】なお、発光ダイオードの代わりに、蛍光管、ネオン管、高圧水銀灯、プラズマ蛍光体、エレクトロルミネッセンス、レーザー光源などを用いても良い。

【００４２】（その他の実施形態）上述の実施形態にかかる投写型表示装置の構成は、投写面を観察する側から投写を行うフロント型の投写型表示装置、および、投写面を観察する側とは反対の側から投写を行うリア型の投写型表示装置のいずれにも応用可能である。

【００４３】また、第１の実施形態にかかる反射型の液晶パネル６（図１参照）の代わりに、デジタルマイクロミラーデバイス（ＤＭＤ）を採用することもできる。なお、デジタルマクロミラーデバイスを採用した場合には、偏光板４、７は不要となる。

【００４４】

【発明の効果】以上の説明したように、本発明の画像形成システム並びに投写型表示装置では、観察者自身の高次大脳レベルで赤色画像、緑色画像、青色画像の順に、時間順次的に画像合成処理されるという生理的メカニズムに鑑み、大脳で画像合成処理される順番とは逆の順番

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で画像形成を行うことにより、１つの合成画像を形成する３色の画像がなるべく同時に大脳で合成されるようにしている。従って、偽輪郭や色ズレ等を軽減することができ、鮮明な像が得られるとともに不快感や眼精疲労を軽減することが可能となる。

【００４５】また、画像形成手段を１つの液晶パネル、デジタルミラーデバイス等で構成することが可能であり、光学系、回路系が単純化されるために、小型化、携帯性の向上が可能となる。また、製造コストの削減も可能となる。

【図面の簡単な説明】

【図１】本発明の第１の実施形態を示す概略図。

【図２】図１におけるカラーフィルタ１およびその変形例を示す平面図。

【図３】カラーフィルタ１の変形例を示す平面図。

【図４】本発明の第２の実施形態を示す概略図。

【図５】図１あるいは図４における色光供給手段２１の変形例を示す図。

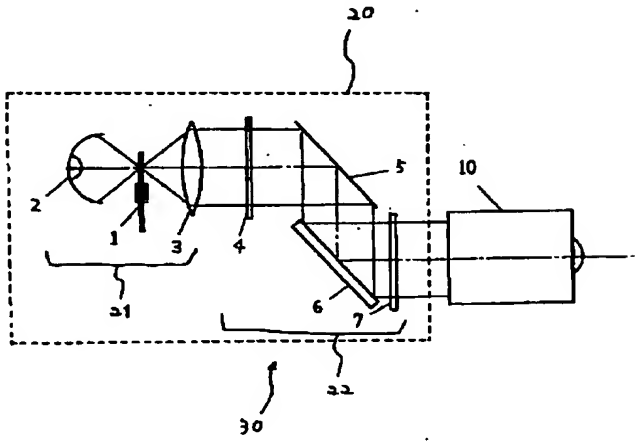
【図６】図５の色光供給手段２１に供給する電気信号を示す図。

【図７】人の網膜構造を説明する図。

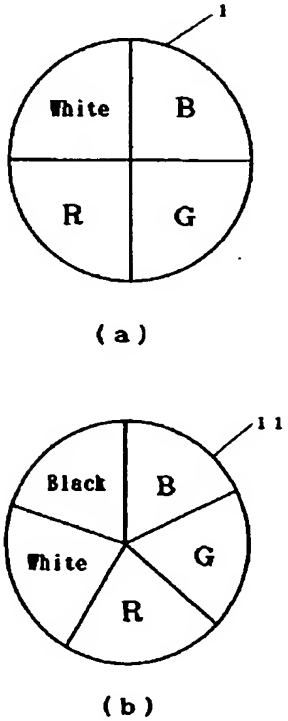
【符号の説明】

１　カラーフィルタ
２　光源
３　集光レンズ
４　偏光板
５　反射ミラー
６　液晶パネル
７　偏光板
８　液晶パネル
１０　投写レンズ
１１、１２、１３　カラーフィルタ
２０　画像形成システム
２１　色光供給手段
２２　画像形成手段
２３　画像形成手段
２４　色光供給手段
２５Ｒ、２５Ｇ、２５Ｂ　発光ダイオード
２６Ｒ、２６Ｇ、２６Ｂ　端子
２７Ｒ、２７Ｇ、２７Ｂ、２８Ｒ、２８Ｇ、２８Ｂ　電気信号
３０　投写型表示装置
４０　画像形成システム
５０　投写型表示装置

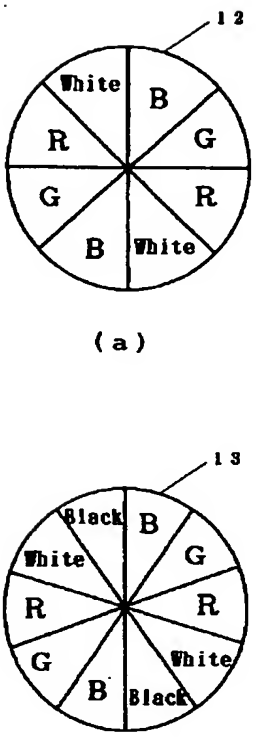
【図１】



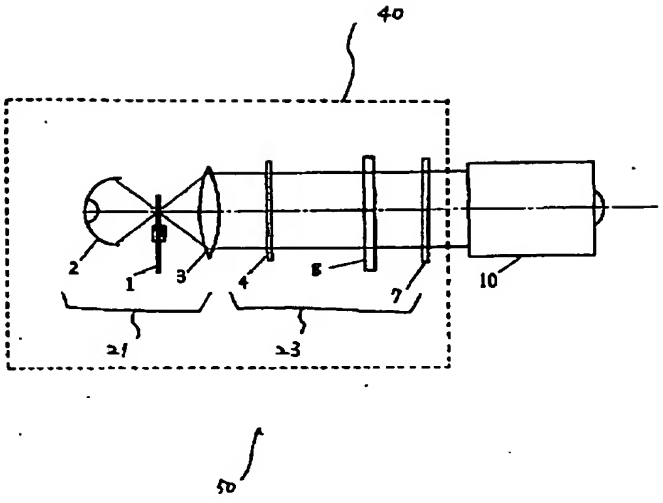
【図２】



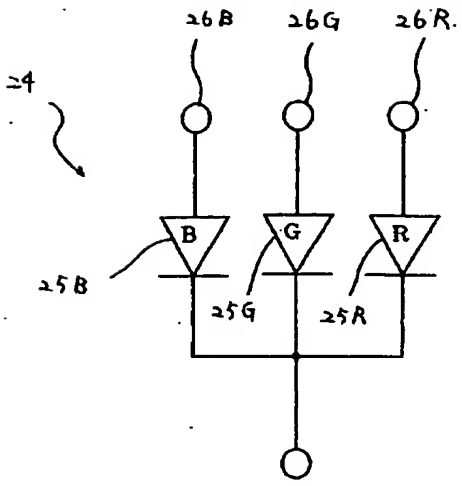
【図３】


12
White
B
G
R
G
R
B
White
(a)
13
Black
B
G
White
R
R
G
White
B
Black
(b)

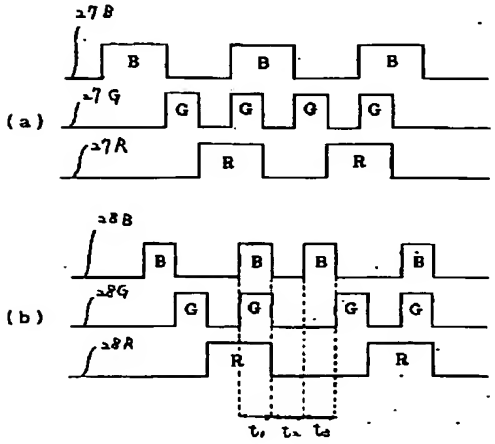
【図４】


40
2
1
3
4
5
7
10
21
23
50

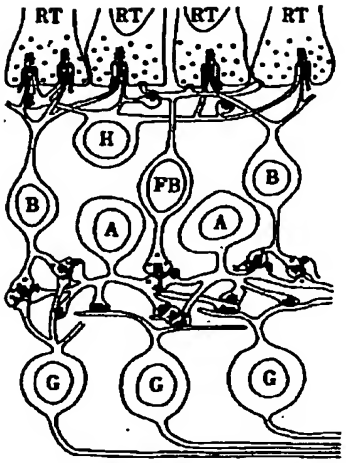
【図５】


24
26B
26G
26R
B
G
R
25B
25G
25R

【図６】


27B
27G
27R
(a)
28B
28G
28R
(b)
B
G
R
t1
t2
t3

【図７】



脊椎動物網膜の細胞間結合模式図（Dowling, 1970）

RT：視細胞，H：水平細胞，BとFB：双極細胞，A：アマクリン細胞，G：神経節細胞．